

# Deep Space 1 Ion Engine Completed a 3-Year Journey

A xenon ion engine and power processor system, which was developed by the NASA Glenn Research Center in partnership with the Jet Propulsion Laboratory and Boeing Electron Dynamic Devices, completed nearly 3 years of operation aboard the Deep Space 1 spacecraft. The 2.3-kW ion engine, which provided primary propulsion and two-axis attitude control, thrusted for more than 16,000 hr and consumed more than 70 kg of xenon propellant.



*30-cm-diameter ion engine mounted to the Deep Space 1 spacecraft gimbal ring.*

The Deep Space 1 spacecraft was launched on October 24, 1998, to validate 12 futuristic technologies, including the ion-propulsion system. After the technology validation process was successfully completed, the Deep Space 1 spacecraft flew by the small asteroid Braille on July 29, 1999. The final objective of this mission was to encounter the active comet Borrelly, which is about 6 miles long. The ion engine was on a thrusting schedule to navigate the Deep Space 1 spacecraft to within 1400 miles of the comet. Since the hydrazine used for spacecraft attitude control was in short supply, the ion engine also provided two-axis attitude control to conserve the hydrazine supply for the Borrelly encounter. The comet encounter took place on September 22, 2001. Dr. Marc Rayman, project manager of Deep Space 1 at the Jet Propulsion Laboratory said, "Deep Space 1 plunged into the heart of the comet Borrelly and has lived to tell every detail of its spine-tingling adventure! The images are even better than the impressive images of comet Halley taken by Europe's Giotto spacecraft in 1986." The Deep Space 1 mission, which successfully tested the 12 high-risk, advanced technologies and captured the best images ever taken of a comet, was voluntarily terminated on December 18, 2001.

The successful demonstration of the 2-kW-class ion propulsion system technology is now providing mission planners with off-the-shelf flight hardware. Higher power, next-generation ion propulsion systems are being developed for large flagship missions, such as outer planet explorers and sample-return missions.

**Find out more about this research:**

Glenn's role in Deep Space 1 <http://www.nasa.gov/centers/glenn/about/history/ds1.html>

Deep Space 1 <http://nmp.jpl.nasa.gov/ds1/>

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